Attorney Docket No.: MTRL014US0

PATENTS
Customer No. 37,141

REMARKS:

The Examiner's allowance of claims 29-40 is gratefully acknowledged.

Reconsideration of the Examiner's objection to the drawings is respectfully requested.

The claims have been amended to replace the term "second passivation layer" with the term -- photoresist layer --. Support for this amendment can be found, for example, at Page 15, Paragraph 35 (see element 217). Applicants respectfully submit that this amendment overcomes the Examiner's objection, because FIG. 6 clearly shows that the layer of photoresist 217 is disposed over the metallization layer 209.

Reconsideration of the Examiner's objection to the specification is respectfully requested.

The Examiner notes that, on Page 15, Line 22, the phrase "redistribution conductor 211" should be changed to "redistribution conductor 221". This change has been made with this response. It is thus respectfully submitted that the Examiner's objection has been overcome.

Prior to dealing specifically with each of the Examiner's prior art rejections, a brief review of the present invention may be helpful.

As noted in paragraph [0006] of the background section of the present application, it has been customary in flip chip applications to provide a layer of material over the redistribution conductor, often in the form of a passivation layer, that is used in combination with one or more passivation layers underneath the redistribution conductor to mechanically reinforce the redistribution conductor and

to clamp the redistribution conductor in place. Such an arrangement minimizes the amount of CTE differential stresses borne by the redistribution conductor. In a typical device, this is important, because the redistribution conductor is too thin to bear such stresses without breaking.

An example of a prior art device having the aforementioned configuration is shown in FIG. 1 of the present application. This device is similar in many respects to the devices shown in the art cited by the Examiner. Notably, the bond between the redistribution conductor and the passivation layers in a device such as that shown in FIG. 1 is not frangible, even if that bond is weak, because the passivation layers are specifically designed to support and encapsulate the redistribution conductor and to alleviate stress applied to it. In order to do so, the stress applied to the bond between the redistribution conductor and passivation layers must also be minimized. With these differences in mind, the Examiner's prior art rejections will now be dealt with in turn.

Reconsideration of the Examiner's rejection of claims 23-25 and 27-28 under 35 U.S.C. § 102(e) as being anticipated by Lee et al. (U.S. 2003/134,496) is respectfully requested.

Applicants respectfully note that, in order to anticipate a claimed invention, a cited reference must disclose each and every element of the claimed invention. In the present case, however, Lee et al. does not disclose the element of claim 23 of a redistribution conductor having a "laterally extending portion [which forms] a frangible bond to the passivation layer."

In the device of Lee et al., as with the device shown in FIG. 1 of the present application, the redistribution

conductor (ostensibly defined by layers 90, 92 and 94; see FIG. 4L) is encapsulated between passivation layers 84 and 100. Hence, the redistribution conductor in this device would not be frangible, even if it was otherwise identical to the redistribution conductor used in the present invention. The same holds true for the prior art device shown in FIG. 3 of Lee et al., where the redistribution conductor (ostensibly defined by layers 26, 28, 30 and 32) is encapsulated between passivation layers 26 and 42.

With respect to claim 28, Applicants respectfully note that Lee et al. does not contain any teachings about the thickness of the redistribution conductor disclosed therein. Hence, Lee et al. cannot anticipate claim 28. Indeed, the design of the device in Lee et al. strongly suggests that the redistribution conductor disclosed therein is very thin (e.g., less than about 1 micron).

Thus, for example, Lee et al. utilizes a patterned terminal electrode layer 30. Such an element is commonly used when solder is being deposited and reflowed on a thin conductor because, during reflow, some of the conductor will dissolve into the solder. Hence, a terminal electrode serves to thicken the conductor at the point where reflow is intended to occur to compensate for this phenomenon. Notably, a terminal electrode is not required with a redistribution conductor of the presently claimed thickness, because the conductor is sufficiently thick to withstand any thinning that occurs during reflow.

Reconsideration of the Examiner's rejection of claims 26 and 28 under 35 U.S.C. § 103(a) as being unpatentable over Lee et al. (U.S. 2003/134,496) in view of Wang et al. (U.S. 6,362,087) is respectfully requested.

In order to render a claimed invention obvious, a proposed combination of references must teach or suggest

each and every element of the claimed invention. However, as noted above, Lee et al. fails to teach or suggest a redistribution conductor having a "laterally extending portion [which forms] a frangible bond to the passivation layer." Indeed, as noted above, the device of Lee et al. is specifically designed so that this bond will not be frangible. Hence, not only does Lee et al. fail to render the presently claimed invention obvious, it actually teaches away from it.[1] Wang et al. does not cure this deficiency, because Wang et al. also teaches a device in which the redistribution conductor is encapsulated in passivation layers 22 and 15. Hence, the bond in that device is also not frangible.

With respect to the thickness limitations of claim 28, the Examiner argues that these limitations would have been obvious and would depend on the thickness of the desired contact and on the dimensions of the circuit. However, contrary to the Examiner's assertion, one skilled in the art would have no incentive to modify the thickness of the redistribution conductor in the device of Lee et al. so as to meet the present claim limitations, because the resulting device would fail for its intended purpose.

In particular, the Examiner's argument ignores the inherent limitations in the design of Lee et al. For example, in the approach of Lee et al., the redistribution conductor is placed directly over a (rigid) silicon oxide passivation layer 84 (this is also true for the prior art device depicted in FIG. 3 of Lee et al.). While such a thin, rigid passivation layer is suitable for thin (e.g., less than 1 micron) redistribution conductors of the type commonly used in the prior art, the use of a thicker redistribution conductor (e.g., a redistribution conductor

[1] This is in contrast to the present invention, where the redistribution conductor is specifically designed (e.g., by making it sufficiently

having the claimed thickness) in this configuration would cause the rigid passivation layer 84 to crack. Indeed, it is for this reason that the present applicants use a second, compliant passivation layer over the first passivation layer. This fact is noted in paragraph [0024] of the present application:

> The second passivation layer **57** is preferably a compliant film that prevents mechanical stresses from fracturing the first passivation layer. The second passivation layer preferably comprises a polyimide, but may also comprise benzocyclobutene (BCB).

Notably, neither Lee et al. nor Wang et al. recognize this problem, or Applicants' solution to it. Hence, contrary to the Examiner's suggestion, one skilled in the art would not find it obvious to modify the device of Lee et al. by increasing the thickness of the redistribution conductor.

The Commissioner is hereby authorized to charge any fee due with this response, or to credit any overpayment, to the deposit account of Hulsey, Grether, Fortkort & Webster, LLP, Deposit Account No. 50-2726. Please reference our docket No. MTRL014US0.

Respectfully submitted,

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Dated: 1-22-2004

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thick) so that it will withstand such stresses.